# CHAPTER FIVE – WATER USE

**LAW**

*10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:*

*10631 (b)(3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic records.*

*10631 (e) (1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors including, but not necessarily limited to, all of the following uses:*

*A) Single-family residential; (B) Multifamily; (C) Commercial; (D) Industrial; (E) Institutional and government; (F) Landscape; (G) Sales to other agencies; (H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof; and (I) Agricultural.*

*B) The water use projections shall be in the same 5-year increments to 20 years or as far as data is available.*

## 5.1    Past, Current, and Projected Water Use

### 5.1.1    HISTORICAL WATER USE

The City provides potable water service to its residential, commercial, industrial, and institutional customers within the City limits. In 2007, the City produced approximately 831.9 million gallons or 2553 acre-feet (af) which is equivalent to an average 2.28 million gallons per day (mgd) of water servicing a population of approximately 9,873.

The total gallons of water used per year since 1996 is summarized in Table 5.1-1. For a complete summary by year and month see Appendix I. From 1996-2007 the per capita usage varied from a high of 251 gallons per day in 1996 to a low of 217 gallons per day in 1998.

Reflections on how different climatic conditions affect water use can be seen in Tables 5.1-3, 5.1-4, and 5.1-5. These tables reflect water usage during a single dry water year, average water years, and multiple dry water years. [Checklist #22, §10631(c)(1)]

**Table 5.1-1**
**Historical Water Production**

| Year | Population | Total Water Production (G) | Average Flow Per Minute (gpm) | Average Daily Demand (gpd) | Maximum Daily Demand (gpd) | Maximum to Average Day Ratio | Average Per Capita Consumption (gpcd) |
|------|-----------|---------------------------|-------------------------------|----------------------------|----------------------------|------------------------------|---------------------------------------|
| **1996** | 8,370 | 767,360,090 | 1,460 | 2,102,356 | 3,495,338 | 1.66 | 251 |
| **1997** | 8,493 | 776,055,352 | 1,477 | 2,126,179 | 3,319,619 | 1.56 | 250 |
| **1998** | 8,618 | 681,093,700 | 1,296 | 1,866,010 | 3,356,181 | 1.80 | 217 |
| **1999** | 8,733 | 768,144,300 | 1,461 | 2,104,505 | 3,361,442 | 1.60 | 241 |
| **2000** | 9,185 | 769,648,502 | 1,464 | 2,108,626 | 3,339,561 | 1.58 | 230 |
| **2001** | 9,278 | 806,939,800 | 1,535 | 2,210,794 | 3,517,971 | 1.59 | 238 |
| **2002** | 9,424 | 812,679,300 | 1,546 | 2,226,519 | 3,656,013 | 1.64 | 236 |
| **2003** | 9,600 | 826,082,400 | 1,572 | 2,263,239 | 3,835,245 | 1.69 | 236 |
| **2004** | 9,681 | 861,745,156 | 1,640 | 2,360,946 | 3,820,223 | 1.62 | 244 |
| **2005** | 9,788 | 834,656,900 | 1,588 | 2,286,731 | 3,852,329 | 1.68 | 234 |
| **2006** | 9,904 | 873,240,304 | 1,661 | 2,392,439 | 4,028,887 | 1.68 | 242 |
| **2007** | 9,873 | 831,900,510 | 1,583 | 2,279,179 | 3,946,845 | 1.73 | 231 |
|  |  |  |  | **Average Flow Ratio:** |  | **1.65** |  |

(1)  Population from U.S. Census Data. *2000 population comes from US Census Count, 2001-2007 are based on a 2009 estimate based on 2000 counts.
(2)  Total Water Production and Maximum Daily Flow from field data
(3)  All other columns are derived from data provided in (1) and (2)

From the previous Chapter 3, Table 3-1.1 depicts the current capacities and characteristics for all eight wells. As shown, the wells can produce a total of 5,597gpm without the use of Well E6W. In 2007, the Average Flow Per Minute was 1,583gpm, which is well under the level of capacity. The maximum daily flow in 2007 was 2,741 gpm that is also under the level of capacity. [Checklist #20, §10631(b)(3)]

It should be noted that the current water levels compare favorably to the historic water levels. The depth to ground water in the late 1960s was approximately 80 feet. Table 3-1.1 shows the overall ground water level averaging 83 feet in depth ground water depth. Five of the seven wells are within 10 feet of 1960 levels and one of the seven wells has a ground water depth of 62 feet.

### 5.1.2    CURRENT WATER SERVICE CONNECTIONS

The City of Exeter requires metering of all public, domestic, commercial and industrial water connections. Table 5.1-2 summarizes the City's water service connections as of the end of 2007.

Data regarding the distribution of water use among domestic, commercial and small industrial water connections has been estimated for this report by the City Finance and engineering staff. The City's 2007 total water usage is 831.9 MGY (2553 acre feet).

**Table 5.1-2**
**Water Service Connections**

|  | Total |
|---|---|
| Residential | 2,988 |
| Commercial | 269 |
| Industrial | 19 |
| **Total Active Connections**[9] | 3,276 |

### 5.1.3   WATER PEAKING FACTORS

Water peaking factors are significantly valuable in analyzing a water system to determine future water consumption values.  The peaking factor is the ratio of the maximum flow to the average daily flow in a water system. The peaking factor is a concept used in the drinking water industry for nearly 100 years.

Definitions for the peaking factors relevant to this analysis are as follows.

#### AVERAGE DAILY DEMAND (ADD)

The Average Daily Demand is typically computed using historical water usage.

For this analysis, the projected ADD was determined using the most current average per capita consumption of water as shown in Table 5.1-1.

#### MAXIMUM DAILY DEMAND (MDD)

The maximum day demand (MDD) represents the maximum consumption during any one day of the year.  The maximum day peaking factor is expressed as a ratio of the maximum day demand divided by the ADD.  The ratio generally ranges from 1.2 for very large water systems to 3.0 or even higher for specific small systems.

For the City of Exeter, the single day with the maximum water consumption normally occurs during the hottest month of the year.  In general, the maximum day flow is 2.0 or 2.5 times greater than the average annual demand.   The historical MDD found in Table 5.1-1 shows the average flow ratio from 1996 to 2007 to be 1.65.  For this study, a conservative flow ratio value of 2.0 is used to determine future MDD values.

*Maximum Day Demand = 2.0 x Average Day Demand*

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[9] Exeter 2008 Water System Master Plan – All connections are metered

**PEAK HOUR DEMAND (PHD)**

The maximum flow rate delivered by the distribution system on any single hour during the year corresponds to the peak hour water demand. The peak hour demand (PHD) is the peak hour water demand divided by the average daily demand (ADD). Peak hour demands typically occur during the morning hours. In the absence of historical peak hour water flows, a peak hour demand of 3.0 to 3.5 may be used. For this study a PHD of 3.0 is used.

*Peak Hour Demand = 3.0 x Average Day Demand*

The values for the ADD, PHD and MDD are shown in Table 4-3 (Appendix F) for each year based on the future population projections described in subsection 5.1.5.

### 5.1.4    PAST, CURRENT, AND PROJECTED PER-CAPITA CONSUMPTION

The per capita consumption rate is used for estimating the City's future water requirements, evaluating the adequacy of the supply source, and determining storage needs. The consumption rate, expressed in gallons per capita per day (gpcd), is applied to the projected population to yield future water requirements. Utilizing the 2010 UWMP Methodologies, the **Base Daily per Capita Water Use** is calculated as **235gpcd**[10]. This value represents the consumption rate to be used to estimate future water requirements of the City based on a 10-15 year cycle. As shown in Table 5.1-4, the corresponding **urban water use target** is **188gpcd**[11] for year 2020. The **interim base water use target** is **212gpcd**[12] for year 2015. [Checklist #20, §10631(b)(3)]

### 5.1.5    PROJECTED WATER USE

Based on future trends in population provided by the US Census Bureau and the most recent per capita water consumption rate of 235gpcd, the City's future water requirements are estimated and summarized in Table 5.1-6. In addition to the projected average daily demands (ADD), Table 5.1-6 includes 5 year estimates for MDD, through the planning horizon year of 2040. Based on these projections, it is anticipated that the City's average day and maximum day requirements for 2040 (w/o targeted reductions) will be over 4.2 MGD (2,946 gallons per minute (gpm)) and 8.5 MGD (5,893 gpm), respectively.

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[10] Refer to Table 5.1-4.

[11] The target urban water use value is determined by determining a 20% reduction in water use for the determined base daily per capita water use over a ten year period. Additionally, this target water usage should also reduce water usage below a 5% reduction in water use for the determined base daily per capita over a five year period. For a numeric representation of the target urban water use, refer to table 5.1-4.

[12] Refer to Table 5.1-5.

**Table 5.1-3**
**Base Daily Per Capita Water Use Calculation (5 year cycle)[13]**

| Base Years | Service Area Population | Gross Water Use (gallon per day) | Daily Per Capita Water Use (gallon) |
|---|---|---|---|
| 2003 | 9,600 | 2,263,239 | 236 |
| 2004 | 9,681 | 2,360,946 | 244 |
| 2005 | 9,788 | 2,286,731 | 234 |
| 2006 | 9,904 | 2,392,439 | 242 |
| 2007 | 9,873 | 2,279,179 | 231 |
| **Base Daily Per Capita Water Use (5 yr average)** | | | **237** |
| **95% of Base Daily Per Capita Water Use (5 yr)** | | | |
| **2015 Minimum Daily Per Capita Water Use** | | | **225** |

**Table 5.1-4**
**Calculation of Urban Water Use Target (10 year cycle)[14]**

| Base Years | Service Area Population | Gross Water Use (gallon per day) | Daily Per Capita Water Use (gallon) |
|---|---|---|---|
| 1998 | 8,618 | 1,866,010 | 217 |
| 1999 | 8,733 | 2,104,505 | 241 |
| 2000 | 9,185 | 2,108,626 | 230 |
| 2001 | 9,278 | 2,210,794 | 238 |
| 2002 | 9,424 | 2,226,519 | 236 |
| 2003 | 9,600 | 2,263,239 | 236 |
| 2004 | 9,681 | 2,360,946 | 244 |
| 2005 | 9,788 | 2,286,731 | 234 |
| 2006 | 9,904 | 2,392,439 | 242 |
| 2007 | 9,873 | 2,279,179 | 231 |
| **Base Daily Per Capita Water Use (10 yr average)** | | | **235** |
| **2020 Urban Water Use Target** (gal/capita/day) = 80% of 10yr | | | **188** |
| **2015 Min. Base Daily Per Capita Water Use** (See Table 5.1-3) = 95% of 5yr | | | **225** |

[13] Use 5 year base period for Water Use to check for legislation required 5% reduction in water use. Most recent year in base period must end no earlier than Dec 31, '07 and no later than Dec 31, '10. This 5-year period also serves as the sampling of multiple dry water years. The single dry water use for Exeter is 2007.

[14] Use 10 year base period for Water Use to check for legislation required 20% reduction in water use. Most recent year in base period must end no earlier than Dec 31, '04 and no later than Dec 31, '10.

**Table 5.1-5**
**Interim Urban Water Use Target**

| | |
|---|---|
| Base Daily Per Capita Water Use (10 yr average) | 235 |
| 2020 Urban Water Use Target (gal/capita/day) | 188 |
| **Average between Base Water Usage and Target =** **Interim Urban Water Use Target for 2015** | **212** |

**Table 5.1-6**
**Projected Average and Maximum Daily Demand (ADD & MDD)**
**Through 2040 (Gallons per Day) w/o target reductions[15]**

| | Year | | | | | |
|---|---|---|---|---|---|---|
| | **2015** | **2020** | **2025** | **2030** | **2035** | **2040** |
| **ADD** | 2,665,605 | 2,925,750 | 3,211,275 | 3,522,180 | 3,868,985 | 4,243,160 |
| **MDD** | 5,331,210 | 5,851,500 | 6,422,550 | 7,044,360 | 7,737,970 | 8,486,320 |

## 5.2    Expansion Projects

*Law*

*10910.(a)  Any city or county that determines that a project, as defined in section 10912, is subject to the California Environmental Quality Act X shall comply with this part.*

*10912.  For the purpose of this part, the following terms have the following meanings:*

*10912 (a)  "Project" means any of the following:*

*(1) A proposed residential development of more than 500 dwelling units.*
*(2) A proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space.*
*(3) A proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space.*
*(4) A proposed hotel or motel, or both, having more than 500 rooms.*
*(5) A proposed industrial, manufacturing or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,00 square feet of floor area.*
*(6) A mixed-use project that includes one or more of the projects specified in this subdivision.*
*(7) A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.*

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[15] Using projected population growth rate of 1.88% (Figure 2.4-1) and 235 gallons per day per capita consumption without the emergency Fire Flow Requirements (FFR = 1500gpm).

**5.2.1   PROJECTED WATER USE**

The City has no knowledge regarding any proposed projects of the sizes or water demands defined in the law given the City's size.  It is unlikely that such projects will be proposed or built within the 2040 planning horizon.  If so proposed, project compliance with Sections 10910 through 10914 will be required.

## *5.3    Water Shortage Expectations*

The water use projections in Table 5.1-6 assume any potential increase in use will be offset by the increased water supply provisions.  Without diversified water resources available, during a catastrophic event the City would have to rely on the importation of water from other regions by means of truck or bottled supplies. [Checklist #23, §10631(c)(2)]

## *5.4    Other Water Uses*

The City has no, and does not anticipate having any, water uses other than those already described.  The following methods to obtain water are not considered practical or needed by the City at this time. The City will reconsider utilizing these methods in the future.
- Water transfers [Checklist #24, §10631(d)];
- Water sales;
- Saline barriers;
- Desalinated water projects [Checklist #31, §10631(i)];
- Groundwater recharge; and
- Conjunctive use.